Technical Outreach Service to Communities
Document Summary

Technical Outreach Services for Communities (TOSC) provides free technical assistance to communities affected by hazardous substance contamination. We are staffed by university faculty and technical outreach specialists and are a part of the Western Region Hazardous Substance Research Center at Oregon State University. TOSC activities are supported by a grant from the United States Environmental Protection Agency.

This is a summary of the document titled *90% Design Report for On-site Containment and Treatment of Perchlorate in Groundwater Olin/Standard Fusee Site, Morgan Hill, California*, prepared by GeoSyntec Consultants for Olin Corporation and dated October 24th, 2003.

TOSC has attempted to summarize the important aspects and highlights of the document. The reader of this summary is encouraged to read the original document if they seek a more detailed and complete presentation of the information it contains.

Note: The 90% Design Report summarized here does not discuss the remediation of on-site soil or off-site water contamination.

The 90% Design Report is part of a group of documents referred to as the 90% Design package.

90% Design Package contents:

1. Design Report (five sections)
    a. Section 1- Introduction
    b. Section 2- Summary of activities carried out to characterize the site geology and hydrogeology beneath the site.
    c. Section 3- Explanation and rationale for the groundwater treatment system design.
    d. Section 4- anticipated schedule for completion of the design, procurement, installation and startup of the groundwater remediation system.
    e. Section 5- report references.

2. The rest of the package is appendices to the 90% Design Report. Noteworthy items are:

    a. Aquifer Test Program (ATP) Report – Presents data from hydraulic testing of the A and B1 test zones of the aquifer. Previous reports from Olin on the design of a remedial approach to removing perchlorate from groundwater on-site identified 3 zones of

groundwater flow coming from the site. Zone A is 0-50 feet below ground surface (bgs), zone B 50-100 feet bgs and zone C greater than 200 ft bgs. Based upon on-site monitoring well data it was determined that the perchlorate was present mainly in zones A& B. The 90% Design Report uses new geological data to further refine the flow models and has broken zone B into three zones, B1, B2, and B3. Zone B1 begins at about 79 ft bgs and extends to about 103 ft bgs.

b. Appendix I contains Olin's responses to the comments of the Regional Water Quality Control Board (RWQCB) to the 45% Design Report previously submitted. A reading of the comments and responses gives one a better understanding of how a remedial design plan is advanced from one level to the next.

Section 1- Introduction

The report states a goal to install and initiate operation of the on-site groundwater containment and treatment system in Dec. 2003. Olin wants comments on the 90% Design Report by Oct. 31st in order to meet the schedule that was mandated by the RWQCB in September 2003. That schedule requires Olin to submit a report detailing installation of the containment and treatment system by Dec. 31st.

1.1 Overview of the Groundwater Containment and Treatment Approach

The 90% Design Report calls for the same system of hydraulic containment and above ground treatment of water presented in the 45% Design Report. The perchlorate-contaminated groundwater will be collected as it leaves the site, pumped to the surface and treated to remove the perchlorate. An ion-exchange system is then used to remove the perchlorate from the groundwater.

Hydraulic containment was defined in a previous TOSC summary of the report *Phase 3 Soil and Groundwater Investigation and Remedial Conceptual Design Report* for the Olin/ Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California (prepared for Olin by MACTEC Engineering and Consulting and dated June 30, 2003):

Hydraulic Containment: *Extraction wells are used to control ground water flow and to remove contaminant mass from aquifers. The purpose is to contain plume migration by redirecting ground water from source areas or to control groundwater plumes by creating preferential flow patterns. One or more wells are installed in a configuration that changes the ground water flow pattern. The configuration of the extraction well network is determined by the site's hydrogeology and the goals of the remediation effort. Wells may be installed upgradient, downgradient, or both. Controlling groundwater plume behavior through extraction requires a detailed understanding of the hydrogeologic conditions, accurate models, and continuous monitoring of ground water and contaminant flow to ensure the desired results are achieved.*

An earlier report (*Potentially Feasible Groundwater Treatment Technologies For Perchlorate*, Olin/ Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California prepared by: MACTEC Engineering and Consulting, March 31, 2003) describes the disposable ion-exchange system the 90% Design Report proposes using. The TOSC review of the March 31st report summarized disposable ion-exchange as it was presented in that report. That summary description is excerpted here:

Disposable Resin Ion-exchange*- Removes the negatively charged perchlorate ions from water by passing the water through a resin material that binds to the perchlorate ions. Since perchlorate can be difficult to remove from ion-exchange resin, this system uses disposable resin.*
Past Use- No specific past use described in document but implied.
Advantages- Removes all perchlorate to below the present acceptable level of 4 parts per billion.
Disadvantages- Expended or damaged resin must be disposed of as perchlorate waste.
Contamination level effectiveness- Technology favored when treating perchlorate concentrations below 500 ppb at lower flow rates.
Regulatory Status- Accepted in CA for perchlorate removal from potable water; has not received permit for potable use.

1.2 Objectives of the 90% Design Report:

Primary objective: To document the evolution of the design from a 45% completion level to a 90% completion level. To do this the report focuses on:

1. Presenting data obtained from the ATP. The data deals with the hydraulic characteristics of the aquifer and the chemical characteristics of the groundwater.
2. Estimates of the hydraulic properties of the aquifer based upon the data collected.
3. Developing an on-site groundwater flow model to support the design of the system used to extract the water from the ground.
4. The evolution of options to discharge the treated water in light of the data obtained from the aquifer test plan.
5. Development of programs to monitor the performance of the system of hydraulic containment and above ground perchlorate removal based upon groundwater flow model simulations.

Section 2- Site Conditions

This section discusses the geology and hydrogeology of the site and the distribution of perchlorate in the groundwater below the site. Data from the ATP was used to further refine the model of site conditions for use in designing the groundwater extraction system.

The 90% Design Report focuses on two zones below the ground surface. Zone A is from the water table to 52 ft bgs and zone B1 goes from about 79 to 103 ft bgs. These are the zones where aquifer tests have detected perchlorate in the highest concentrations. The groundwater targeted for aboveground treatment will be pumped from these zones. However, the report states, “Olin will continue to collect groundwater data from deeper zones following implementation and startup of the on-site groundwater containment and treatment system to evaluate whether hydraulic containment of deeper flow zones is required”.

This section also contains information about the chemistry of the groundwater and how that relates to the workability of the proposed remediation system. Samples of the groundwater have been tested for a variety of physical parameters and for the presence of other substances that could interfere with the operation of the system, in particular, the ion-exchange treatment system used to remove the perchlorate form the groundwater. The data from the testing has been evaluated and the report states, “The groundwater chemistry is not expected to provide any unique challenges with respect to treatment, or achieving the required treatment level for perchlorate”. The groundwater chemistry also did not reveal any parameters that would prevent the treated water from being discharged under the permit regulations of the Clean Water Act.

Section 3- Design Basis and Rationale

This section outlines five elements that “most significantly influence the potential for meeting the remedial objective”, that objective being the “hydraulic containment and treatment of perchlorate in on-site groundwater”. The five elements are:

1. Hydraulic containment through the design and placement of the wells used to extract the groundwater.

From the report: “ Hydraulic containment of on-site groundwater containing perchlorate will be accomplished through operation of groundwater extraction wells located primarily along the southern Site boundary, adjacent to Tennant Avenue”.

The containment process will concentrate on zones A and B1 based upon monitoring data that shows consistent detection of perchlorate in those zones. Deeper groundwater flow zones have been identified but they have not shown consistent detections of perchlorate. The report does state, “…Olin will continue to analyze groundwater data collected from ongoing and future monitoring activities to evaluate whether hydraulic containment and treatment of deeper flow zones is required”.

The report discusses how the containment and treatment system was designed to be compatible with potential soil remediation alternatives. If application of the treated water and flushing of the soil is to be used, the system fully encompasses the potential soil treatment areas. The location of the wells along the Site boundaries is also compatible with excavation and on-site bioremediation alternatives for soil contamination.

2. Removal of perchlorate from the groundwater to acceptable levels.

   The disposable ion-exchange system chosen for the removal of perchlorate from extracted groundwater is, as the 90% Design Report states, “a proven, cost effective, flexible, and reliable technology that has been used at other similar sites throughout the state of California”. Of the alternatives explored by Olin the ion-exchange system was “ultimately selected as the best technology given the groundwater chemistry at the Site”.

3. Managing the treated water, deciding where to discharge it after removal of the perchlorate.

   Three options are given for discharging the treated water:

   1. Surface discharge to a storm drain located at the intersection of Tennant and Railroad Avenues that drains to the Butterfield Retention Pond.
   2. Surface application (infiltration/irrigation) to the site in order to flush more of the perchlorate on-site into the aquifer for capture and treatment.
   3. Re-injection of the treated water via a recharge well into a zone of the aquifer that does not contain perchlorate.

   The discharge of the treated water is still under discussion. The report states that the water will initially and primarily be discharged to the storm drain. This differs somewhat from an earlier report that contemplated application and infiltration of the treated water over the site to drive more of the perchlorate in the soil to the aquifer (leaching) where it would ideally be trapped by the containment system and then treated along with the water being hydraulically contained in sort of a “loop” system.

   In their comments on the 45% Design Report the RWQCB and the VWD expressed concerns about using the infiltration/leaching technique. Among these concerns was that the application/infiltration of treated water could cause the perchlorate to migrate off-site in unpredictable ways. The agencies feel that more information is needed about site conditions before such an option is pursued.

   The 90% Design Report states that Olin is continuing to evaluate the application/infiltration option and that the viability of this option will be considered in detail as part of the Soil Remediation Feasibility Study that will be submitted separately from the 90% Design Report.

4. Developing a means to monitor the functioning of the system performance.

   The containment and treatment system will be monitored to ensure that it is functioning properly. The wells used to extract the groundwater will be tested for perchlorate and other parameters weekly until conditions stabilize and then monthly thereafter. As stated in the Report, the data will be “used to assess seasonal and temporal changes in groundwater chemistry in the A and B1 flow

zones. The scope and frequency of monitoring will be evaluated after six months of system operation to assess its adequacy".

The monitoring of hydraulic containment and geochemical conditions will be achieved using a combination of new and existing wells to be installed and developed in November 2003. Whenever possible, any wells located off-site will be installed in public right-of-ways rather than on private property.

5. Developing a contingency plan for the system.

The contingency planning section of the 90% Design Report is reproduced here in its entirety:
"The performance monitoring activities described in the previous section (*TOSC note: the section of the report dealing with performance monitoring*) provide the means by which Olin will evaluate whether remedial objectives are being achieved. Contingency planning is an important element of the groundwater remediation system as it provides potential response actions that would be implemented if performance objectives were not met. Olin will develop a Contingency Plan and submit it with the 31 December 2003 system installation report.

Section 4- Schedule

The 90% Design Report calls the schedule "extremely aggressive" and that it "presumes rapid regulatory approvals and allows no contingencies for weather-related or other delays outside of Olin's control". If delays do occur, the Report states that, "the schedule will need to be adjusted accordingly".

The schedule as it appears in the Report is reproduced below:

Task Description	**Tentative Completion Date**
Submit 90% Design Report	October 24, 2003
RWQCB Approval of 90% Design	October 31, 2003
EW-A-002 Installation & Development	November 28, 2003
Performance Monitoring Wells Installation & Development	November 28, 2003
Permitting and Site Improvements	November 28, 2003
Ex Situ Treatment Equipment Delivery on Site	December 1, 2003
Mechanical and Electrical Installations	December 15, 2003
Baseline Sampling of New Wells	December 15, 2003
System Startup & Shakedown	December 30, 2003
Full-Scale Operational On-Site Groundwater System	December 31, 2003
System Installation Report & Contingency Plan	December 31, 2003